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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

MCDONALD, RODNEY GLENN

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/725,449	Applicant(s) YAMADA ET AL.	
	Examiner Rodney G. McDonald	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-6,8-13,16-18,20-24 and 31-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-6,8-13,16-18,20-24 and 31-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4, line 3, is indefinite because "smother" is indefinite.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4, 8-13, 16-18, 20, 21, 22, 23, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hilton et al. (US PG PUB 2002/0060084 A1) in view of

Regarding claims 1, 13, 33, Hilton et al. teach a process whereby a substrate 130 is obtained. (See Fig. 3). A die placement area is identified and a keep out area of the substrate is identified. (i.e. the die placement area is the area between treated regions 340 and the keep out area is the area from the regions 340 to the edge of the substrate 130) (See Fig. 3) A protective area 340 is formed over the substrate between the die placement area and the keep out area. (See Fig. 3; paragraph 0030) An

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underfill material 320 is formed over at least the die placement area of the substrate and the underfill material is prevented from flowing over the protective area based on surface roughness. (See Fig. 3; paragraph 0030; Here the examiner interprets “over” to mean completely over the area 340. In Figure 3 the underfill material does not flow over the edge of the area 340 as shown in the Figure. Therefore the underfill material does not flow “over” completely over the protective area) Furthermore, Hilton et al. teach providing a dam, barrier or discontinuity to prevent underfilling material from entering the keep out area. (Paragraph 0010)

Regarding claim 1, 13, 33, Hilton et al. teach a method comprising selecting a protective area of a substrate. Providing a second surface roughness over the selected protective area of the substrate. (See Fig. 3; Paragraph 0030)

Regarding claim 2, Hilton et al. teach determining an area in which to prevent overflow of underfill material. (See Fig. 3; Paragraph 0030)

Regarding claim 8, Hilton et al. teach providing an underfill material over the first area of the substrate. (See Fig. 3; Paragraph 0030)

Regarding claim 9, Hilton et al. teach that the protective area is selected to avoid underfill overflow into a particular are of a chip. (See fig. 3; Paragraph 0030)

Regarding claim 10, Hilton et al. teach attaching a die over the first area of the substrate. (See Fig. 3; Paragraph 0002, 0003, 0030)

Regarding claim 11, Hilton et al. teach providing underfill material between the die and the substrate without overflowing the underfill material over all of the protective area. (See fig. 3; Paragraph 0030; Here the examiner interprets “over” to mean

completely over the area 340. In Figure 3 the underfill material does not flow over the edge of the area 340 as shown in the Figure. Therefore the underfill material does not flow completely “over” the protective area)

Regarding 14, Hilton et al. teach a method comprising selecting a protective area of a substrate. Providing a second surface roughness over the selected protective area of the substrate. (See Fig. 3; Paragraph 0030)

Regarding claim 20, Hilton et al. teach attaching a die 110 over the die placement area of the substrate. (Fig. 3; Paragraph 0002, 0003)

Regarding claim 21, Hilton et al. teach flowing the underfill material between the die and the die placement area of the substrate. (Paragraph 002, 003, 0030)

Regarding claim 22, Hilton et al. teach that the underfill material flows in the die placement area without flowing to the keep out area based on the surface roughness of the die placement area and the surface roughness of the protective area. (See Paragraph 0030; The die placement area has an inherent roughness. The area 340 is roughened to prevent flow to the keep out area.)

Regarding claim 23, the protective area 340 is selected to avoid underfill overflow into the keep out area of the substrate. (See fig. 3; Paragraph 0030)

Regarding claim 31, Hilton et al. teach the first area to comprise a die placement area. (See Fig. 3)

The differences between Hilton et al. and the present claims is that performing a selective sputtering process to a surface of the substrate to provide the first surface roughness and to provide a second surface roughness smoother than the first surface

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roughness is not discussed (Claim 1), the selective sputtering process including using a mask to cover selected protected areas of the substrate during the selective sputtering process is not discussed (Claim 1), the selective sputtering process providing less sputtering to the protective area than the first area such that the protective area is smoother than the first area is not discussed (Claims 4, 16) and the mask covering the protective area of the substrate is not discussed (Claim 32).

Regarding performing a selective sputtering process to a surface of the substrate to provide the first surface roughness and to provide a second surface roughness smoother than the first surface roughness (Claim 1), Hilton teach performing a surface roughness to provide a first area having a roughness and a second area having a roughness less than the first roughness. (Paragraph 0030). Banks suggest a sputtering process for forming a roughened area utilizing a mask. (Column 1 lines 52-57)

Regarding the selective sputtering process including using a mask to cover selected protected areas of the substrate during the selective sputtering process for forming a roughened area utilizing a mask, Banks suggest a sputtering process for forming a roughened area utilizing a mask. (Column 1 lines 52-57)

Regarding claims 4, 16, Hilton et al. teach providing a roughened area which would be smoother than the protective area since that area is not roughened. (Paragraph 0030) Banks suggest limiting the area by using a mask. (Column 1 lines 52-57)

Regarding claim 32, Banks teach utilizing a mask to cover a protective area of the substrate. (Column 1 lines 52-57)

The motivation for utilizing the features of Banks et al. is that it allows for forming a roughened surface. (Column 1 lines 52-57)

Claims 5, 6, 17, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hilton et al. in view of Banks et al. as applied to claims 1, 2, 4, 8-13, 16-18, 20, 21, 22, 23, 31 and 32 above, and further in view of Maydan et al. (U.S. Pat. 4,298,443).

The differences not yet discussed are the use of oxygen plasma sputtering (Claims 5, 17) and the use of hydrogen plasma sputtering (Claims 6, 18).

Regarding claims 5, 6, 17, 18, Maydan et al. teach that sputter etching can be carried out in the gases of oxygen or hydrogen. (Column 6 lines 32-41)

The motivation for utilizing the features of Maydan et al. is that it allows for sputter etching a substrate. (Column 6 lines 32-41)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized the features of Maydan et al. because it allows for sputter etching a substrate.

Claims 12 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hilton et al. in view of Banks et al. as applied to claims 1, 2, 4, 8-13, 16-18, 20, 21, 22, 23, 31 and 32 above, and further in view of Dias (US PG PUB 2003/0109080 A1).

The difference not yet discussed is the use of a solder resist. (Claims 12, 24)

Regarding claim 12, Dias teaches a process utilizing a solder resist on a substrate for a die bonding process. (Page 3 paragraph 0039).

The motivation for utilizing the features of Dias is that it allows for bonding a die to a substrate. (Page 3 paragraph 0039)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized the features of Dias because it allows for bonding a die to a substrate.

Claims 33-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hilton et al. in view of Banks et al. as applied to claims 1, 2, 4, 8-13, 16-18, 20, 21, 22, 23, 31 and 32 above, and further in view of Ohsawa et al. (U.S. Pat. 6,514,847).

The difference not yet discussed is where selective chemical etching is used to form the roughness. (Claims 33-36)

Regarding claims 33-36, Ohsawa et al. teach utilizing selective chemical etching to form the roughness. (Column 5 lines 29-38)

The motivation for utilizing the features of Ohsawa et al. is that it allows for forming a dam. (Column 5 lines 29-38)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized the features of Ohsawa because it allows for forming a dam.

Response to Arguments

Applicant's arguments filed November 30, 2007 have been fully considered but they are not persuasive.

In response to the argument that the applied references do not teach performing a selective sputtering process to a surface of the substrate to provide a first surface roughness over a first area and to provide a second surface roughness over the selected protective area where the second surface roughness is smoother than the first surface roughness, it is argued that Hilton teach providing an area having a rougher area than the other area in order to prevent material to flow into a protected area. Banks recognize utilizing a mask to etch particular areas of the substrate. Therefore one of ordinary skill in the art would modify Hilton by utilizing a mask to roughen a particular area of the substrate in order to provide a rougher area to inhibit flow of material into a protected area. (See Hilton and Banks et al. discussed above)

In response to the argument that the references do not teach the selective sputtering process including using a mask to cover the selected protective area of the substrate during the selective sputtering process, it is argued that Banks teach utilizing a mask to sputter etch particular areas of the substrate. Hilton teaches what areas to roughen by etching. (See Banks and Hilton discussed above)

In response to the argument that the references do not teach performing a selective chemical etching process to a surface of the substrate to provide a first surface roughness over a first area of a substrate and to provide a second surface roughness over the selected protective area of the substrate, the second surface roughness being smoother than the first surface roughness, it is argued that Hilton establish roughening a first area and leaving the remainder of the substrate smooth. Ohsawa et al. teach selective chemical etching to roughen an area of the substrate.

Therefore, one of ordinary skill in the art would modify Hilton by utilizing selective chemical etching because selective chemical etching roughens particular areas of the substrate which Hilton require. (See Hilton and Ohsawa et al. discussed above)

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M-Th with every Friday off..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rodney G. McDonald/
Primary Examiner, Art Unit 1795

Rodney G. McDonald
Primary Examiner
Art Unit 1795

RM
February 11, 2008